WORKSHEET - Mathematics Standard 2

Algebra (Std 2)

A1 Formulae and Equations (Y11)

Substitution and Other Equations (Std 2)/ Applications: BAC, Medication and D=ST (Std 2)

Teacher: Angus Colquhoun

Exam Equivalent Time: 114 minutes *(based on HSC allocation of 1.5 minutes approx. per mark)*

Questions

1. Algebra, 2UG 2005 HSC 2 MC

   What is the value of $\frac{a-b}{4}$, if $a = 240$ and $b = 56$?

   (A) 4

   (B) 46

   (C) 226

   (D) 736

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2. Algebra, 2UG 2006 HSC 2 MC

   If $V = \frac{4}{3}\pi r^3$, what is the value of V when $r = 2$, correct to two decimal places?

   (A) 8.38

   (B) 12.57

   (C) 25.13

   (D) 33.51

---

3. Algebra, 2UG 2016 HSC 2 MC

   Which of the following equations has $x = 5$ as the solution?

   (A) $x - 5 = 10$

   (B) $5 - x = 10$

   (C) $\frac{x}{2} = 10$

   (D) $2x = 10$

---

4. Algebra, 2UG 2017 HSC 07 MC

   It is given that $I = \frac{3}{2}MR^2$.

   What is the value of I when $M = 26.55$ and $R = 3.07$, correct to two decimal places?

   A. 375.35

   B. 3246.08

   C. 9965.45

   D. $14\,948.18$

---

5. Algebra, 2UG 2004 HSC 3 MC

   If $K = Ft^3$, $F = 5$ and $t = 0.715$, what is the value of K correct to three significant figures?

   (A) 1.82

   (B) 1.827

   (C) 1.828

   (D) 1.83

---

6. Algebra, 2UG 2015 HSC 2 MC

   Which of the following is $4x + 3y - x - 5y$ in its simplest form?

   (A) $3x - 2y$

   (B) $3x + 8y$

   (C) $5x - 2y$

   (D) $5x + 8y$

---

7. Algebra, 2UG 2017 HSC 09 MC

   What is the value of x in the equation $\frac{5-x}{3} = 6$?

   A. -13

   B. -3

   C. 3

   D. 13

---

8. FS Driving, 2UG 2017 HSC 02 MC

A car is travelling at 95 km/h.

How far will it travel in 2 hours and 30 minutes?

A. $38\ \text{km}$

B. $41.3\ \text{km}$

C. $218.5\ \text{km}$

D. $237.5\ \text{km}$

---

9. FS Health, 2UG 2016 HSC 11 MC

The concentration of a drug in a certain medication is 100 mg / 5 mL. A patient is prescribed 2000 mg of the drug.

How much medication should be given to the patient?

(A) 4 mL

(B) 25 mL

(C) 100 mL

(D) 400 mL

---

10. FS Driving, 2UG HSC S-1 MC

The blood alcohol content (BAC) of a male's blood is given by the formula;

$$BAC_{\text{male}} = \frac{10N - 7.5H}{6.8M}$$, where

N is the number of standard drinks consumed,

H is the number of hours drinking and

M is the person's mass in kgs.

Calculate the BAC of a male who consumed 4 standard drinks in 3.5 hours and weighs $68\ \text{kgs}$, correct to 2 decimal places.

(A) 1.03

(B) 0.03

(C) 0.04

(D) 0.01

---

11. FS Driving, 2UG 2012 HSC 15 MC

The time taken to complete a journey varies inversely with the speed of a car. A car takes 6 hours to complete a journey when travelling at $60\ \text{km/h}$.

How long would the same journey take if the car were travelling at $100\ \text{km/h}$?

(A) 36 minutes

(B) 1 hour and 40 minutes

(C) 3 hours and 6 minutes

(D) 3 hours and 36 minutes

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12. Algebra, 2UG 2008 HSC 9 MC

What is the value of $\sqrt{\dfrac{x+2y}{8y}}$ if $x = 5.6$ and $y = 3.1$, correct to 2 decimal places?

(A) 0.69

(B) 2.62

(C) 2.83

(D) 4.77

---

13. Algebra, 2UG 2004 HSC 11 MC

If $d = 6t^2$, what is a possible value of t when $d = 2400$?

(A) 0.05

(B) 20

(C) 120

(D) 400

---

14. Algebra, 2UG 2005 HSC 14 MC

Using the formula $d = 5t^3 - 2$, Marcia tried to find the value of t when $d = 137$.

Here is her solution. She has made one mistake.

$$
\begin{aligned}
d &= 5t^3 - 2 \\
137 &= 5t^3 - 2 \quad \ldots\ldots\ldots \text{ Line } A \\
135 &= 5t^3 \quad \ldots\ldots\ldots \text{ Line } B \\
27 &= t^3 \quad \ldots\ldots\ldots \text{ Line } C \\
t &= 3 \quad \ldots\ldots\ldots \text{ Line } D
\end{aligned}
$$

Which line does NOT follow correctly from the previous line?

(A) Line A

(B) Line B

(C) Line C

(D) Line D

---

15. Algebra, 2UG 2016 HSC 5 MC

Which expression is equivalent to $2(3x - 4) + 2$?

(A) $6x - 2$

(B) $6x - 4$

(C) $6x - 6$

(D) $6x - 10$

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16. FS Driving, 2UG 2015 HSC 23 MC

The number of 'standard drinks' in various glasses of wine is shown.

Number of standard drinks

White Wine		*Red Wine*	
small glass	*large glass*	*small glass*	*large glass*
0.9	1.4	1.0	1.5

A woman weighing 62 kg drinks three small glasses of white wine and two large glasses of red wine between 8 pm and 1 am.

What would be her blood alcohol content (BAC) estimate at 1 am, correct to three decimal places?

(A) 0.030

(B) 0.037

(C) 0.046

(D) 0.057

---

17. FS Driving, 2UG 2016 HSC 10 MC

Caroline drinks two small bottles of wine over a three-hour period. Each of these bottles contains 2.3 standard drinks. Caroline weighs 53 kg.

What is her approximate blood alcohol content (BAC) at the end of this period?

(A) 0.081

(B) 0.065

(C) 0.0017

(D) 0.0014

---

18. FS Health, 2UG 2017 HSC 19 MC

Young's formula, shown below, is used to calculate the dosage of medication for children aged 1–12 years based on the adult dosage.

$$D = \frac{yA}{y + 12}$$

where D = dosage for children aged 1–12 years

y = age of child (in years)

A = Adult dosage

A child's dosage is calculated to be 20 mg, based on an adult dosage of 40 mg.

How old is the child in years?

A. 6

B. 8

C. 10

D. 12

---

19. Algebra, 2UG 2010 HSC 7 MC

If $M = -9$, what is the value of $\frac{3M^2 + 5M}{6}$

(A) -250.5

(B) -48

(C) 33

(D) 235.5

---

20. FS Driving, 2UG 2011 HSC 21 MC

A train departs from Town A at 3.00 pm to travel to Town B. Its average speed for the journey is $90\ \text{km/h}$, and it arrives at 5.00 pm. A second train departs from Town A at 3.10 pm and arrives at Town B at 4.30 pm.

What is the average speed of the second train?

(A) $135\ \text{km/h}$

(B) $150\ \text{km/h}$

(C) $216\ \text{km/h}$

(D) $240\ \text{km/h}$

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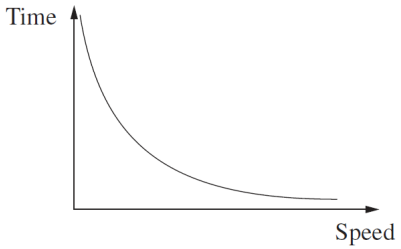
21. Algebra, 2UG 2009 HSC 16 MC

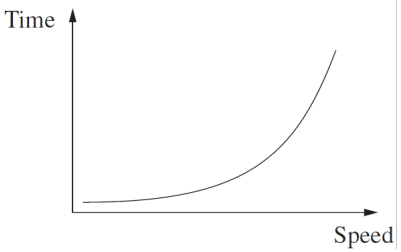
The time for a car to travel a certain distance varies inversely with its speed.

Which of the following graphs shows this relationship?

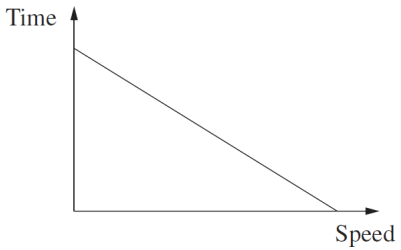
(A)



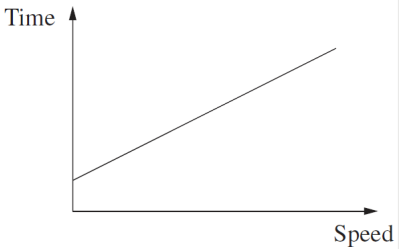
(B)



(C)



(D)



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22. FS Health, 2UG 2014 HSC 4 MC

Young's formula below is used to calculate the required dosages of medicine for children aged 1–12 years.

$$\text{Dosage} = \frac{\text{age of child (in years)} \times \text{adult dosage}}{\text{age of child (in years)} + 12}$$

How much of the medicine should be given to an 18-month-old child in a 24-hour period if each adult dosage is 45 mL? The medicine is to be taken every 6 hours by both adults and children.

(A) $5\ \text{mL}$

(B) $20\ \text{mL}$

(C) $27\ \text{mL}$

(D) $30\ \text{mL}$

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23. Algebra, 2UG AM1 SM-Bank 03

Find the value of r given $\frac{r}{7} - 4 = 3$. *(1 mark)*

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24. Algebra, 2UG AM1 SM-Bank 04

If $\frac{y-3}{3} = 5$, find y. *(1 mark)*

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25. Algebra, 2UG AM1 SM-Bank 01

What is the value of $5a^2 - b$, if $a = -4$ and $b = 3$. *(2 marks)*

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26. Algebra, 2UG AM1 SM-Bank 02

If $A = P(1+r)^n$, find A given $P = \$300$, $r = 0.12$ and $n = 3$ (give your answer to the nearest cent). *(2 marks)*

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27. Algebra, 2UG 2007 HSC 24b

The distance in kilometres (D) of an observer from the centre of a thunderstorm can be estimated by counting the number of seconds (t) between seeing the lightning and first hearing the thunder.

Use the formula $D = \frac{t}{3}$ to estimate the number of seconds between seeing the lightning and hearing the thunder if the storm is 1.2 km away. *(1 mark)*

---

28. Algebra, 2US A1 SM-Bank 05

Fried's formula is used to calculate the medicine dosages for children aged 1-2 years.

$$\text{Child dosage} = \frac{\text{Age(in months)} \times \text{adult dosage}}{150}$$

Ben is 1.5 years old and receives a daily dosage of 450 mg of a medicine.

According to Fried's formula, what would the appropriate adult daily dosage of the medicine be? *(2 marks)*

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29. Algebra, 2US A1 SM-Bank 07

If $S = V_0(1-r)^n$, find S given $V_0 = \$42\,000, r = 0.16$ and $n = 4$. (give your answer to the nearest cent) *(2 marks)*

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30. FS Health, 2UG 2015 HSC 26b

Clark's formula is used to determine the dosage of medicine for children.

$$\text{Dosage} = \frac{\text{weight in kg} \times \text{adult dosage}}{70}$$

The adult daily dosage of a medicine contains 3150 mg of a particular drug.

A child who weighs 35 kg is to be given tablets each containing 525 mg of this drug.

How many tablets should this child be given daily? *(2 marks)*

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31. FS Health, 2UG 2015 HSC 27b

A patient requires 2400 mL of fluid to be delivered at a constant rate by means of a drip over 12 hours. Each mL of fluid is equivalent to 15 drops.

How many drops per minute need to be delivered? *(2 marks)*

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32. Algebra, 2UG AM3 SM-Bank 07

The volume of a sphere is given by $V = \frac{4}{3}\pi r^3$ where r is the radius of the sphere.

If the volume of a sphere is $220\ \text{cm}^3$, find the radius, to 1 decimal place. *(3 marks)*

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33. FS Health, 2UG SM-Bank 01

A patient is to receive 1.8 L of pain killer medication by intravenous drip that will take 1.5 hours to administer.

Given 1 mL = 4 drops, calculate the amount of drops per minute the machine must be set on. *(2 marks)*

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34. FS Health, 2UG SM-Bank 02

A medication is available in both tablet and liquid form. A tablet contains 50 mg of the active ingredient while the liquid form contains 60 mg per 10 mL.

Michael likes taking tablets and Georgia prefers liquid medicines. If they each need 0.2 g of the active ingredient, what dosages do they take? *(3 marks)*

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35. Algebra, 2UG 2009 HSC 25a

Simplify $5 - 2(x + 7)$. *(2 marks)*

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36. Algebra, 2UG 2010 HSC 24a

Fred tried to solve this equation and made a mistake in Line 2.

$$\begin{aligned} 4(y+2) - 3(y+1) &= -3 && \text{Line 1} \\ 4y + 8 - 3y + 3 &= -3 && \text{Line 2} \\ y + 11 &= -3 && \text{Line 3} \\ y &= -14 && \text{Line 4} \end{aligned}$$

Copy the equation in Line 1 into your writing booklet.

(i) Rewrite Line 2 correcting his mistake. *(1 mark)*

(ii) Continue your solution showing the correct working for Lines 3 and 4 to solve this equation for y. *(1 mark)*

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37. Algebra, 2UG 2015 HSC 28d

The formula $C = \frac{5}{9}(F - 32)$ is used to convert temperatures between degrees Fahrenheit (F) and degrees Celsius (C).

Convert $3°C$ to the equivalent temperature in Fahrenheit. *(2 marks)*

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38. Algebra, 2US A1 SM-Bank 06

Make p the subject of the equation $c = \frac{5}{3}p + 15$. *(2 marks)*

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39. Algebra, 2US A1 SM-Bank 08

What is the value of $\frac{a+b}{ab}$ if $a = -2.1$ and $b = -3.6$, correct to 1 decimal place? *(2 marks)*

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40. FS Driving, 2UG 2014 HSC 29b

What is the maximum number of standard drinks that a male weighing 84 kg can consume over 4 hours in order to maintain a blood alcohol content (BAC) of less than 0.05? *(3 marks)*

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41. FS Driving, 2UG 2017 HSC 27e

Rhys is drinking low alcohol beer at a party over a five-hour period. He reads on the label of the low alcohol beer bottle that it is equivalent to 0.8 of a standard drink.

Rhys weighs 90 kg.

What is the maximum number of complete bottles of the low alcohol beer he can drink to remain under a Blood Alcohol Content (BAC) of 0.05? *(4 marks)*

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42. FS Health, 2UG 2005 HSC 24b

The formula $D = \frac{2A}{15}$ is used to calculate the dosage of Hackalot cough medicine to be given to a child.

- D is the dosage of Hackalot cough medicine in millilitres (mL).
- A is the age of the child in months.

(i) If George is nine months old, what dosage of Hackalot cough medicine should he be given? *(1 mark)*

(ii) The correct dosage of Hackalot cough medicine for Sam is 4 mL.

What is the difference in the ages of Sam and George, in months? *(3 marks)*

---

43. FS Health, 2UG SM-Bank 03

Bronwyn needs to have 3.0 litres of intravenous liquid given to her over a period of 4 hours.

What is the required flow rate in mL per minute? *(2 marks)*

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44. Algebra, 2US A1 SM-Bank 04

Doris is driving in a school zone at a speed of 35 kilometres per hour and needs to stop immediately to avoid an accident.

It takes her 1.25 seconds to react and her breaking distance is 5.3 metres

What is Doris' total stopping distance? Give your answer to 1 decimal place. *(2 marks)*

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45. FS Driving, 2UG 2015 HSC 30d

Claire is driving on a motorway at a speed of 110 kilometres per hour and has to brake suddenly. She has a reaction time of 2 seconds and a braking distance of 59.2 metres.

Calculate her stopping distance. *(2 marks)*

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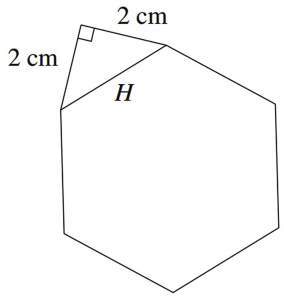
46. Algebra, 2UG 2007 HSC 28b

This shape is made up of a right-angled triangle and a regular hexagon.



NOT TO SCALE

The area of a regular hexagon can be estimated using the formula $A = 2.598H^2$ where H is the side-length.

Calculate the total area of the shape using this formula. ***(3 marks)***

Worked Solutions

1. Algebra, 2UG 2005 HSC 2 MC

$$\frac{a-b}{4} = \frac{240-56}{4}$$
$$= 46$$
$$\Rightarrow B$$

2. Algebra, 2UG 2006 HSC 2 MC

$$V = \frac{4}{3}\pi r^3$$
$$\text{When } r = 2$$
$$V = \frac{4}{3}\pi \times 2^3$$
$$= 33.510\ldots$$
$$\Rightarrow D$$

3. Algebra, 2UG 2016 HSC 2 MC

$$2x = 10$$
$$\therefore x = 5$$
$$\Rightarrow D$$

4. Algebra, 2UG 2017 HSC 07 MC

$$I = \frac{3}{2} \times 26.55 \times (3.07)^2$$
$$= 375.346\ldots$$
$$\Rightarrow \text{A}$$

5. Algebra, 2UG 2004 HSC 3 MC

$$
\begin{aligned}
K &= Ft^3 \\
&= 5 \times (0.715)^3 \\
&= 1.8276... \\
&= 1.83 \ \text{(3 sig figures)} \\
&\Rightarrow D
\end{aligned}
$$

---

6. Algebra, 2UG 2015 HSC 2 MC

$$
\begin{aligned}
&4x + 3y \ - x \ - 5y \\
&\quad = 3x - 2y \\
&\Rightarrow A
\end{aligned}
$$

---

7. Algebra, 2UG 2017 HSC 09 MC

$$
\begin{aligned}
&\frac{5 - x}{3} = 6 \\
&5 - x = 18 \\
&\quad x = 5 - 18 \\
&\quad\ = \ -13 \\
&\Rightarrow \ \text{A}
\end{aligned}
$$

---

8. FS Driving, 2UG 2017 HSC 02 MC

$$
\begin{aligned}
&\text{Distance} = 95 \times 2.5 \\
&\qquad\quad = 237.5 \ \text{km} \\
&\Rightarrow \ \text{D}
\end{aligned}
$$

---

9. FS Health, 2UG 2016 HSC 11 MC

$$
\begin{aligned}
&\text{Volume required} \\
&\quad = \frac{2000}{100} \times 5 \\
&\quad = 100 \ \text{mL} \\
&\Rightarrow C
\end{aligned}
$$

---

10. FS Driving, 2UG HSC S-1 MC

$$
\begin{aligned}
BAC_{\text{male}} &= \frac{(10 \times 4) \ - (7.5 \times 3.5)}{(6.8 \times 68)} \\
&= \frac{13.75}{462.4} \\
&= 0.0297... \\
&\Rightarrow \ B
\end{aligned}
$$

---

11. FS Driving, 2UG 2012 HSC 15 MC

$$
\begin{aligned}
&T = \frac{D}{S} \\
&\text{Since} \ \ T = 6 \ \ \text{when} \ \ S = 60 \\
&\quad 6 = \frac{D}{60} \\
&\quad D = 360 \ \text{km} \\
&\\
&\text{Find} \ \ T \ \ \text{when} \ \ S = 100 \ \ \text{and} \ \ D = 360 \\
&\quad T = \frac{360}{100} \\
&\qquad = 3.6 \ \text{hours} \\
&\qquad = 3 \ \text{hrs} \ \ 36 \ \text{minutes} \\
&\Rightarrow \ D
\end{aligned}
$$

---

12. Algebra, 2UG 2008 HSC 9 MC

$$
\begin{aligned}
\sqrt{\frac{x + 2y}{8y}} &= \sqrt{\frac{5.6 + (2 \times 3.1)}{(8 \times 3.1)}} \\
&= \sqrt{\frac{11.8}{24.8}} \\
&= 0.6897... \\
&\Rightarrow \ A
\end{aligned}
$$

---

13. Algebra, 2UG 2004 HSC 11 MC

$$d = 6t^2$$
$$t^2 = \frac{d}{6}$$
$$t = \pm\sqrt{\frac{d}{6}}$$

When $d = 2400$

$$t = \pm\sqrt{\frac{2400}{6}}$$
$$= \pm 20$$
$$\Rightarrow B$$

---

14. Algebra, 2UG 2005 HSC 14 MC

$$d = 5t^3 - 2$$
$$137 = 5t^3 - 2 \quad \ldots \text{ Line A}$$
$$139 = 5t^3 \quad \ldots \text{ Line B}$$

$\therefore$ Line B doesn't follow on correctly.

$$\Rightarrow B$$

---

15. Algebra, 2UG 2016 HSC 5 MC

$$2(3x - 4) + 2$$
$$= 6x - 8 + 2$$
$$= 6x - 6$$
$$\Rightarrow C$$

---

16. FS Driving, 2UG 2015 HSC 23 MC

$$BAC_f = \frac{10N - 7.5H}{5.5M}$$
$$N = 3 \times 0.9 + 2 \times 1.5$$
$$= 5.7 \text{ standard drinks}$$
$$H = 5 \text{ hours}$$
$$M = 62 \text{ kg}$$
$$\therefore BAC_f = \frac{10 \times 5.7 - 7.5 \times 5}{5.5 \times 62}$$
$$= 0.05718\ldots$$
$$\Rightarrow D$$

---

17. FS Driving, 2UG 2016 HSC 10 MC

$$\text{BAC}_f = \frac{10N - 7.5H}{5.5M}$$
$$= \frac{10(2 \times 2.3) - 7.5(3)}{5.5 \times 53}$$
$$= 0.0806\ldots$$
$$\Rightarrow A$$

---

18. FS Health, 2UG 2017 HSC 19 MC

$$D = \frac{yA}{y + 12}$$
$$20 = \frac{40y}{y + 12}$$
$$20(y + 12) = 40y$$
$$20y + 240 = 40y$$
$$20y = 240$$
$$y = 12$$
$$\Rightarrow \text{D}$$

---

19. Algebra, 2UG 2010 HSC 7 MC

♦♦ *Only 31% of students answered correctly!*

$$\begin{aligned}\frac{3M^2+5M}{6} &= \frac{3\times(-9)^2+5\times(-9)}{6}\\ &= \frac{(3\times 81)-45}{6}\\ &= \frac{198}{6}\\ &= 33\end{aligned}$$

$\Rightarrow C$

---

20. FS Driving, 2UG 2011 HSC 21 MC

♦ *Mean mark 49%*

1st train

Travels 2hrs at 90km/h

$$\begin{aligned}\text{Distance} &= \text{Speed}\times\text{Time}\\ &= 90\times 2\\ &= 180\text{ km}\end{aligned}$$

2nd train

Travels 180 km in 1hr 20min $\left(\frac{4}{3}\text{ hrs}\right)$

$$\begin{aligned}\text{Speed} &= \frac{\text{Distance}}{\text{Time}}\\ &= 180\div\frac{4}{3}\\ &= 180\times\frac{3}{4}\\ &= 135\text{ km/h}\end{aligned}$$

$\Rightarrow A$

---

21. Algebra, 2UG 2009 HSC 16 MC

♦ *Mean mark 38%*

$$T\propto\frac{1}{S}$$

$$T=\frac{k}{S}$$

As S $\uparrow$, T $\downarrow$ $\Rightarrow$ cannot be B or D

C is incorrect because it graphs a linear relationship

$\Rightarrow A$

---

22. FS Health, 2UG 2014 HSC 4 MC

♦ *Mean mark 42%*

$$\begin{aligned}\text{Dosage} &= \frac{1.5\times 45}{1.5+12}\\ &= 5\text{ mL}\end{aligned}$$

Since 1 dosage every 6 hrs

In 24 hours,

Medicine given $= 4\times 5 = 20$ mL

$\Rightarrow B$

---

23. Algebra, 2UG AM1 SM-Bank 03

$$\begin{aligned}\frac{r}{7}-4 &= 3\\ \frac{r}{7} &= 7\\ \therefore r &= 49\end{aligned}$$

---

24. Algebra, 2UG AM1 SM-Bank 04

$$\begin{aligned}\frac{y-3}{3} &= 5\\ y-3 &= 15\\ y &= 18\end{aligned}$$

---

25. Algebra, 2UG AM1 SM-Bank 01

$$\begin{aligned} 5a^2 - b &= 5(-4)^2 - 3 \\ &= 5 \times 16 - 3 \\ &= 77 \end{aligned}$$

---

26. Algebra, 2UG AM1 SM-Bank 02

$$\begin{aligned} A &= P(1+r)^n \\ &= 300(1+0.12)^3 \\ &= 300(1.12)^3 \\ &= 421.478... \\ &= \$421.48 \text{ (nearest cent)} \end{aligned}$$

---

27. Algebra, 2UG 2007 HSC 24b

$$D = \frac{t}{3}$$

When $D = 1.2$

$$\frac{t}{3} = 1.2$$

$$t = 3.6 \text{ seconds}$$

---

28. Algebra, 2US A1 SM-Bank 05

Substituting into the formula:

$$450 = \frac{18 \times \text{adult dosage}}{150}$$

$$\therefore \text{ Adult dosage} = \frac{450 \times 150}{18}$$

$$= 3750 \text{ mg}$$

---

29. Algebra, 2US A1 SM-Bank 07

$$\begin{aligned} S &= V_0(1-r)^n \\ &= 42\,000(1-0.16)^4 \\ &= 42\,000(0.84)^4 \\ &= \$20\,910.597... \\ &= \$20\,910.60 \text{ (to nearest cent)} \end{aligned}$$

---

30. FS Health, 2UG 2015 HSC 26b

$$\begin{aligned} \text{Dosage} &= \frac{35 \times 3150}{70} \\ &= 1575 \text{ mg} \end{aligned}$$

$$\begin{aligned} &\#\text{ Tablets per day} \\ &= \frac{\text{Dosage}}{\text{mg per tablet}} \\ &= \frac{1575}{525} \\ &= 3 \end{aligned}$$

$\therefore$ The child should be given 3 tablets per day.

---

31. FS Health, 2UG 2015 HSC 27b

Fluid rate of delivery

$$= \frac{2400}{12}$$
$$= 200 \text{ mL per hour}$$
$$= \frac{200}{60}$$
$$= 3\frac{1}{3} \text{ mL per minute}$$

Since each mL has 15 drops

$$\# \text{ Drops} = 15 \times 3\frac{1}{3}$$
$$= 50 \text{ per minute}$$

---

32. Algebra, 2UG AM3 SM-Bank 07

$$V = \frac{4}{3}\pi r^3$$
$$3V = 4\pi r^3$$
$$r^3 = \frac{3V}{4\pi}$$

When $V = 220$

$$r^3 = \frac{3 \times 220}{4\pi}$$
$$= 52.521\ldots$$
$$\therefore r = \sqrt[3]{52.521\ldots}$$
$$= 3.744\ldots \text{ (by calc)}$$
$$= 3.7 \text{ cm (to 1 d.p.)}$$

---

33. FS Health, 2UG SM-Bank 01

$$\text{Total drops required} = 1800 \times 4$$
$$= 7200 \text{ drops}$$
$$\text{Time (in minutes)} = 1.5 \times 60$$
$$= 90 \text{ minutes}$$
$$\text{Drops per minute} = \frac{7200}{90}$$
$$= 80$$

$\therefore$ The machine must be set to 80 drops per minute.

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34. FS Health, 2UG SM-Bank 02

Michael - tablets

$0.2 \text{ g} = 200 \text{ mg}$

$$\therefore \# \text{ Tablets} = \frac{200}{50}$$
$$= 4$$

Georgia - liquid

60 mg in 10 mL

$$\Rightarrow 1 \text{ mg} = \frac{10}{60} = 0.166\ldots \text{ mL}$$
$$\Rightarrow 200 \text{ mg} = 200 \times 0.166\ldots$$
$$= 33.33\ldots \text{ mL}$$
$$= 33.3 \text{ mL (to 1 d.p.)}$$

$\therefore$ Michael needs to take 4 tablets and Georgia needs to take 33.3 mL.

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35. Algebra, 2UG 2009 HSC 25a

♦ *Mean mark 47%*

$$5 - 2(x + 7) = 5 - 2x - 14$$
$$= -2x - 9$$

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36. Algebra, 2UG 2010 HSC 24a

(i) $4(y+2)-3(y+1) = -3$ **Line 1**

$4y+8-3y-3 = -3$ **Line 2**

(ii) $y+5 = -3$ **Line 3**

$y = -8$ **Line 4**

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37. Algebra, 2UG 2015 HSC 28d

$$C = \frac{5}{9}(F-32)$$

$$F-32 = \frac{9}{5}C$$

$$F = \frac{9}{5}C+32$$

When $C = 3$

$$F = \left(\frac{9}{5}\times 3\right)+32$$

$= 37.4$ degrees F

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38. Algebra, 2US A1 SM-Bank 06

$$c = \frac{5}{3}p+15$$

$$\frac{5}{3}p = c-15$$

$$p = \frac{3}{5}(c-15)$$

$$= \frac{3}{5}c-9$$

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39. Algebra, 2US A1 SM-Bank 08

$$\frac{a+b}{ab} = \frac{-2.1-3.6}{-2.1\times -3.6}$$

$$= \frac{-5.7}{7.56}$$

$$= -0.753\ldots$$

$$= -0.8$$

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40. FS Driving, 2UG 2014 HSC 29b

$$\text{BAC}_{\text{male}} = \frac{10N-7.5H}{6.8M}$$

Find N for BAC < 0.05

given $H = 4$ and $M = 84$

$$\Rightarrow \frac{10N-7.5(4)}{6.8(84)} < 0.05$$

$$10N-30 < 0.05(571.2)$$

$$10N < 28.56+30$$

$$< 58.56$$

$$N < 5.856$$

$\therefore$ Max number of drinks is 5.

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41. FS Driving, 2UG 2017 HSC 27e

$$\begin{aligned}
\text{BAC}_{\text{male}} &= \frac{10N - 7.5H}{6.8M} \\
0.05 &= \frac{10N - 7.5 \times 5}{6.8 \times 90} \\
10N &= (0.05 \times 6.8 \times 90) + 7.5 \times 5 \\
&= 68.1 \\
N &= 6.81 \text{ standard drinks}
\end{aligned}$$

$\therefore$ Number of low alcohol bottles

$$\begin{aligned}
&= \frac{6.81}{0.8} \\
&= 8.51
\end{aligned}$$

$\therefore$ Max complete bottles to stay under 0.05

$$= 8$$

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42. FS Health, 2UG 2005 HSC 24b

(i) $$\begin{aligned}
D &= \frac{2A}{15} \\
&= \frac{2 \times 9}{15} \\
&= 1.2 \text{ mL}
\end{aligned}$$

$\therefore$ George should be given a dosage of 1.2 mL

(ii) Find A when $D = 4$ mL

$$\begin{aligned}
4 &= \frac{2 \times A}{15} \\
2A &= 60 \\
A &= 30
\end{aligned}$$

$\therefore$ Sam is 30 months old and is 21 months older than George.

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43. FS Health, 2UG SM-Bank 03

$$\begin{aligned}
\text{Total liquid} &= 3.0 \times 1000 \\
&= 3000 \text{ mL} \\
\text{Total minutes} &= 4 \times 60 \\
&= 240 \\
\therefore \text{ Flow Rate} &= \frac{3000}{240} \\
&= 12.5 \text{ mL/minute}
\end{aligned}$$

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44. Algebra, 2US A1 SM-Bank 04

$$\begin{aligned}
35 \text{ km/hr} &= 35\,000 \text{ m/hr} \\
&= \frac{35\,000}{60 \times 60} \text{ m/sec} \\
&= 9.722\ldots \text{ m/sec}
\end{aligned}$$

$\therefore$ Total stopping distance

$$\begin{aligned}
&= \text{ Reaction time distance} + \text{braking distance} \\
&= 1.25 \times 9.722\ldots + 5.3 \\
&= 17.452\ldots \\
&= 17.5 \text{ metres (to 1 d.p.)}
\end{aligned}$$

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45. FS Driving, 2UG 2015 HSC 30d

♦ *Mean mark 34%.*

$$\begin{aligned}110 \text{ km/hr} &= 110\,000 \text{ m/hr} \\ &= \frac{110\,000}{60 \times 60} \text{ m/sec} \\ &= 30.555\ldots \text{ m/sec}\end{aligned}$$

$$\begin{aligned}\text{Reaction time distance} &= 2 \times 30.555\ldots \\ &= 61.11\ldots \text{ metres}\end{aligned}$$

$$\begin{aligned}\therefore \text{ Stopping distance} &= \text{ Reaction time distance} + \text{braking} \\ &= 61.11\ldots + 59.2 \\ &= 120.311\ldots \\ &= 120.3 \text{ metres (to 1 d.p.)}\end{aligned}$$

46. Algebra, 2UG 2007 HSC 28b

$$\text{Area} = 2.598H^2$$

Using Pythagoras

$$\begin{aligned}H^2 &= 2^2 + 2^2 \\ &= 8 \\ H &= \sqrt{8}\end{aligned}$$

$$\begin{aligned}\therefore \text{ Area of hexagon} &= 2.598 \times \left(\sqrt{8}\right)^2 \\ &= 20.784 \text{ cm}^2\end{aligned}$$

$$\begin{aligned}\text{Area of triangle} &= \frac{1}{2}bh \\ &= \frac{1}{2} \times 2 \times 2 \\ &= 2 \text{ cm}^2\end{aligned}$$

$$\begin{aligned}\therefore \text{ Total Area} &= 20.784 + 2 \\ &= 22.784 \text{ cm}^2\end{aligned}$$