

E Maths Test for November

 /100 Marks

1. Carlos starts work at 21 20 and finishes at 06 15 the next day. Calculate how long he is at work.

[1]

8 h 55 min

2. Work out $\frac{7}{11}$ of 198kg.

[1]

$$\frac{7}{11} \times 198 = 126$$

3. Saafia has a barrel containing 6000 milliliters of oil, correct to the nearest 100 ml. She uses the oil to fill bottles which each hold exactly 50 ml. Calculate the upper bound for the number of bottles she can fill.

[2]

$$\frac{6050}{50} = 121 \text{ bottles}$$

4. (a) Write the number five million, two hundred and seven in figures.

[1]

5,000,207

- (b) Write 0.00813 in standard form.

[1]

$$8.13 \times 10^{-3}$$

5. Write these numbers correct to 2 significant figures.

- a. 0.076499

0.076

[1]

- b. 10100

10000

[1]

6. **Without using a calculator**, work out $\frac{5}{16} \times 1\frac{1}{7}$. You must show all your working and give your answer as a fraction in its simplest form.

$$\frac{5}{\cancel{16}_2} \times \frac{\cancel{8}^1}{7} = \frac{5}{14}$$

[2]

7. The scale of a map is 1 : 125000.
On a map, the length of an island is 9.4 cm. Calculate the actual length of the island, giving your answer in kilometers.

$$\frac{9.4 \times 125000}{10^5} = 11.75 \text{ km}$$

[3]

8. (a) The n th term of a sequence is $10 - n^2$.
Write down the first three terms of this sequence.

$$9, 6, 1$$

[2]

(b) These are the first four terms of another sequence.

7 10 13 16

Find an expression for the n th term of this sequence.

$$a + (n-1)d$$

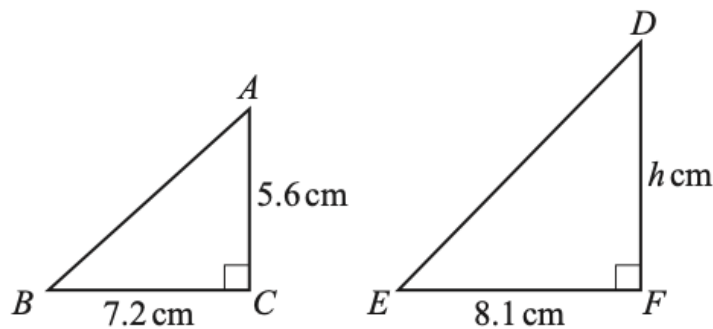
$$7 + (n-1)3$$

$$7 + 3n - 3$$

$$4 + 3n$$

[2]

9.



NOT TO
SCALE

Triangle ABC is similar to triangle DEF . Calculate the value of h .

$$\frac{h}{5.6} = \frac{8.1}{7.2}$$

$$h = 6.3$$

[3]

10. y is inversely proportional to the cube root of $(x + 5)$. When $x = 3$, $y = 12$. Find y when $x = 22$.

$$y \propto \frac{1}{\sqrt[3]{x+5}}$$

$$y = \frac{k}{\sqrt[3]{x+5}}$$

$$x = 3, y = 12 \Rightarrow 12 = \frac{k}{\sqrt[3]{3+5}}$$

$$12 = \frac{k}{2}$$

$$k = 24$$

$$y = \frac{24}{\sqrt[3]{x+5}} \quad [3]$$

$$x = 22 \Rightarrow y = \frac{24}{\sqrt[3]{22+5}}$$

$$= \frac{24}{3} = 8$$

11. Solve the equation $x^2 + 5x - 7 = 0$. You must show all your working and give your answers correct to 2 decimal places.

$$x^2 + 5x - 7 = 0 \quad [4]$$

$$x = \frac{-5 \pm \sqrt{5^2 - 4(1)(-7)}}{2(1)}$$

$$x = \frac{-5 \pm \sqrt{53}}{2}$$

$$x = 1.14 \quad \text{or} \quad -6.14$$

12. $f(x) = 6x - 7$ $g(x) = x^{-3}$

- a. Find $f(x + 2)$. Give your answer in its simplest form.

$$f(x+2) = 6(x+2) - 7 = 6x + 5 \quad [2]$$

b. Find $f^{-1}(x)$.

$$\begin{aligned}
 y &= 6x - 7 & [2] \\
 x &= \frac{y + 7}{6} \\
 f^{-1}(y) &= \frac{y + 7}{6} \\
 f^{-1}(x) &= \frac{x + 7}{6}
 \end{aligned}$$

c. Find x when $g(x) = f(22)$.

$$\begin{aligned}
 x^{-3} &= 6(22) - 7 & [2] \\
 x^{-3} &= 125 \\
 x^{-3} &= 5^3 \\
 \frac{1}{x^3} &= 5^3 \\
 \frac{1}{5^3} &= x^3 \quad \therefore x = \frac{1}{5}
 \end{aligned}$$

13. A train travels between two stations.

1 km

The distance between the stations is 220 km, correct to the nearest kilometre.

The speed of the train is 125 km/h, correct to the nearest 0.5 km/h.

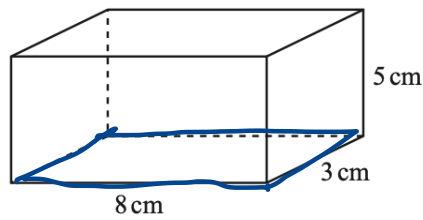
Calculate the upper bound for the time the journey takes. Give your answer in hours and minutes.

$$s = d/t$$

$$\begin{aligned}
 d &= 220.5 & t &= \frac{d}{s} & [4] \\
 s &= 122.5 & \text{UB} &= \frac{\text{UB}}{\text{LB}}
 \end{aligned}$$

$$\begin{aligned}
 t &= \frac{220.5}{122.5} = \frac{9}{5} \text{ h} \\
 &= 1.8 \text{ h} = 1 \text{ h } 48 \text{ min}
 \end{aligned}$$

14.



NOT TO SCALE

Find the total surface area of the cuboid.

$$8 \times 5 = 40 \text{ cm}^2$$

$$3 \times 5 = 15 \text{ cm}^2$$

$$\begin{aligned} & (2 \times 40) + (2 \times 15) + (2 \times 24) \\ &= 80 + 30 + 48 \\ &= 158 \text{ cm}^2 \end{aligned}$$

[3]

$$V = P \times \left(1 + \frac{r}{100}\right)^t$$

15. Anya invests \$6000 in an account that pays compound interest at a rate of $r\%$ per year.

At the end of 8 years, the account has earned \$621.70 in interest. Calculate the value of r .

$$6621.7 = 6000 \times \left(1 + \frac{r}{100}\right)^8$$

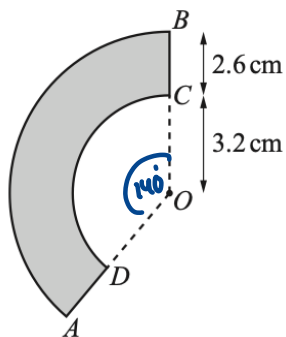
$$8 \sqrt[8]{\frac{6621.7}{6000}} - 1 = \frac{r}{100}$$

$$r = \left[8 \sqrt[8]{\frac{6621.7}{6000}} - 1 \right] \times 100$$

$$= 1.24\%$$

[3]

16.



NOT TO SCALE

The diagram shows a shape, $ABCD$, formed by the sectors of two circles with the same center O . Both sector angles are 140° , $OC = 3.2$ cm and $CB = 2.6$ cm .

The area of the shape is $k\pi\text{cm}^2$.

Find the value of k .

$$\begin{aligned} \left((5.8)^2 \pi - (3.2)^2 \pi \right) \times \frac{140}{360} &= k\pi & [3] \\ \left(23.4 \pi \right) \times \frac{140}{360} &= k\pi \\ \therefore \frac{91\pi}{10} &= k\pi \\ k &= 9.1 \end{aligned}$$

17. C is the point $(5, -1)$ and D is the point $(13, 15)$.

a. Find the midpoint of CD .

$$\left(\frac{5+13}{2}, \frac{-1+15}{2} \right) = (9, 7) \quad [2]$$

b. Find the gradient of CD .

$$\frac{15+1}{13-5} = \frac{16}{8} = 2 \quad [2]$$

- c. Find the equation of the perpendicular bisector of CD . Give your answer in the form $y = mx + c$.

↑
use midpt

$$m_{\perp} = -\frac{1}{2}$$

$$7 = -\frac{1}{2}(9) + c$$

$$c = \frac{23}{2}$$

$$y = -\frac{1}{2}x + \frac{23}{2}$$

[3]

18. Make x the subject of the formula.

$$c = \frac{3x}{2x-5}$$

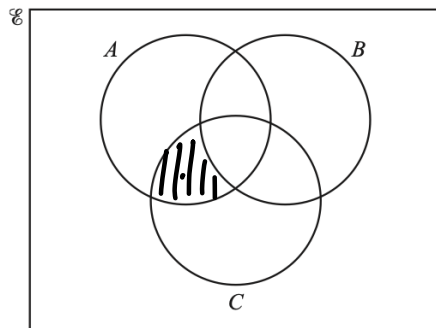
$$2cx - 5c = 3x$$

$$2cx - 3x = 5c$$

$$x = \frac{5c}{2c-3}$$

[4]

- 19.



In the Venn diagram, shade the region $A \cap B' \cap C$.

[1]

20. Write as a single fraction in its simplest form.

$$\frac{5}{3x+2} + \frac{4}{2x-1}$$

$$\frac{10x(-5) + 12x(+8)}{(3x+2)(2x-1)}$$

[3]

$$= \frac{22x + 3}{(3x+2)(2x-1)}$$

21. (a) An orchard has 1250 trees.

The trees are in the ratio apple : pear : cherry = 12 : 9 : 4.

i. Calculate the number of apple trees.

$$12x + 9x + 4x = 1250$$

$$x = 50$$

[2]

$$\text{Apple trees} = 50 \times 12 = 600$$

ii. Last year in the orchard, the mean mass of fruit produced was 64 kg per tree.

Calculate the total mass of fruit produced last year. Give your answer in tonnes.

[1 tonne = 1000 kg]

$$\frac{64 \times 1250}{1000} = 80 \text{ tons}$$

[2]

- iii. Last year, the mean mass of pears produced was 54 kg per tree.
54 kg This was a decrease of 10% on the mean mass of pears produced per tree from the year before.

Calculate the mean mass of pears produced by each pear tree the year before.

$$\begin{aligned} 90\% &= 54 \\ 100\% &= ? \\ &= \frac{54}{90} \times 100 = 60 \end{aligned} \quad [2]$$

- iv. The orchard loses $\frac{1}{5}$ of its total number of trees in a storm.

Calculate the number of trees that remain.

$$1250 - 1250 \times \frac{1}{5} = 1000 \quad [2]$$

(b) Paulo buys some pears from a market.

Pears cost \$0.54 each or 0.51 euros each.

- i. Paulo pays **in dollars** for 12 pears. Calculate the change he receives from \$10.

$$\begin{aligned} 0.54 \times 12 &= \$6.48 \\ \$10 - \$6.48 &= \$3.52 \end{aligned} \quad [2]$$

ii. The exchange rate is \$1 = 0.826 euros.

Calculate how much more Paulo pays for each pear when he pays in euros.

Give your answer in dollars, correct to the nearest cent.

$$12 \times 0.51 = 6.12 \text{ euros} \quad [3]$$

$$\frac{6.12}{0.826} - 6.48 = \$0.9292$$

$$\frac{0.9292}{12} = 0.077 \approx 0.08$$

22. The table shows information about the heights of 80 children.

Height (h metres)	$1.2 < h \leq 1.4$	$1.4 < h \leq 1.5$	$1.5 < h \leq 1.65$	$1.65 < h \leq 1.8$	$1.8 < h \leq 1.9$
Frequency	2	13	24	32	9

a. Write down the interval containing the median.

$$1.62 < h \leq 1.8 \quad [1]$$

b. Calculate an estimate of the mean height.

[4]

$$\frac{(1.3 \times 2) + (1.45 \times 13) + (1.575 \times 24) + (1.725 \times 32) + (1.85 \times 9)}{80}$$

$$= 1.63875$$

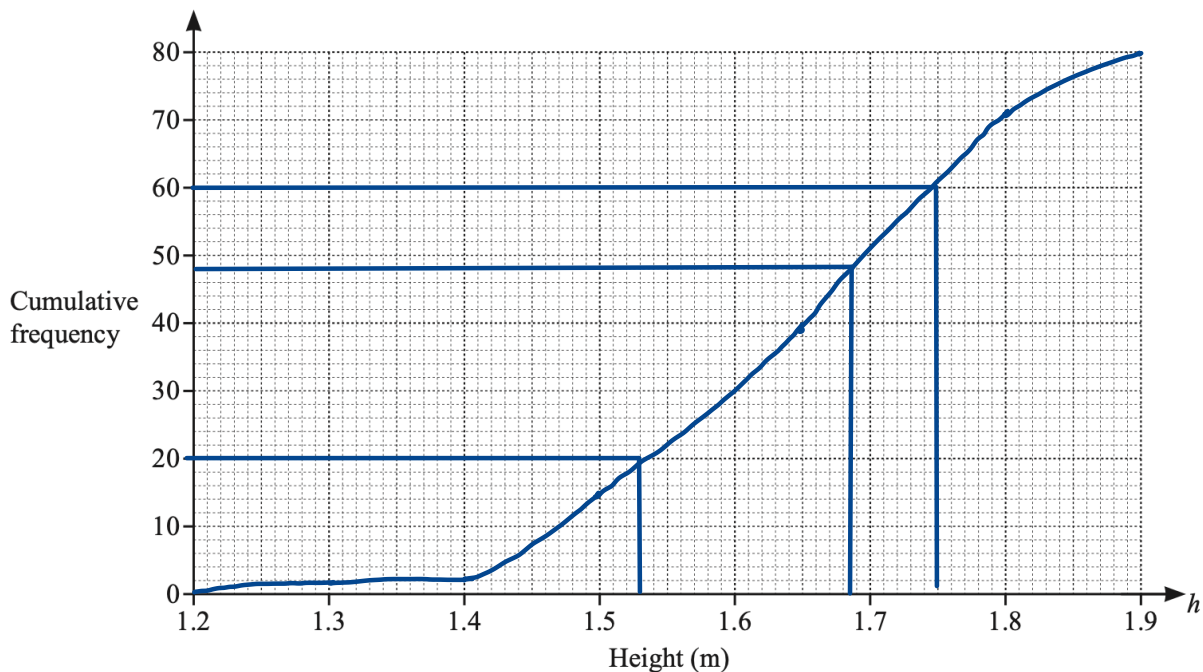
$$\approx 1.64$$

c. Complete the cumulative frequency table for the heights.

Height (h metres)	$h \leq 1.4$	$h \leq 1.5$	$h \leq 1.65$	$h \leq 1.8$	$h \leq 1.9$
Cumulative frequency	2	15	39	71	80

[2]

d. On the grid, draw the cumulative frequency diagram.



[3]

e. Use your diagram to find an estimate of

i. the interquartile range

$$\begin{aligned}
 UQ - LQ &= 1.75 - 1.53 \\
 &= 0.21
 \end{aligned}$$

[2]

ii. the 60th percentile.

$$1.69 \leftarrow 60\%$$

[2]

25. Solve the simultaneous equations.

You must show all your working.

$$x^2 + 4y = 37 \Rightarrow x^2 + 4(-8-5x) = 37$$

$$5x + y = -8 \quad x^2 - 20x - 32 - 37 = 0$$

$$y = -8 - 5x$$

$$x^2 - 20x - 69 = 0$$

$$(x - 23)(x + 3) = 0$$

$$x = 23 \quad \text{or} \quad -3$$

$$y = -123 \quad \text{or} \quad 7$$

[5]

26.