

GCSE (9-1) Mathematics
J560/05 Paper 5 (Higher Tier)

Question Set 1

1. (a) Simplify fully.

$$\frac{3a^8 \times 2a^5}{a^2} = \frac{3a^8 \times 2a^{5-2}}{1} = 3a^8 \times 2a^3 = \boxed{6a^{11}}$$

(a) $6a^{11}$ [3]

(b) Solve.

$$\frac{6x-10}{5} = 1 \quad (\times 5)$$

$$6x - 10 = 5$$

$$6x = 5 + 10$$

$$\frac{6x}{6} = \frac{15}{6}$$

$$\boxed{x = \frac{5}{2}}$$

(b) $x = \dots\dots\dots \frac{5}{2} \dots\dots\dots$ [3]

2. (a) A sunflower grows at a rate of 4 cm each day.

How many days does it take to grow from a height of 80 cm to more than 1.06 m?

$$\text{day} = x \quad \text{rate} = 4 \text{ cm/day} \quad 1.06 \text{ m} = 106 \text{ cm}$$

$$4 \times x > 106 - 80 = 26$$

$$\frac{4x}{4} > \frac{26}{4}$$

$$x > 6.5 \text{ days}$$

whole number greater than 6.5
= 7

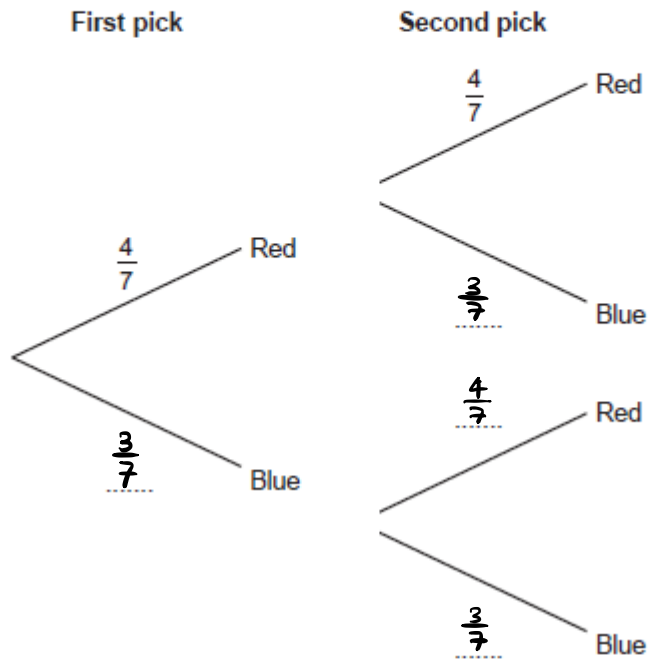
(a) 7 days [3]

(b) If the sunflower grows at a faster rate, how would this affect your answer to part (a)?

..... The number of days required would decrease [1]

3. A bag contains 4 red counters and 3 blue counters only. Jack picks a counter at random and then replaces it. Jack then picks a second counter at random.

(a) Complete the tree diagram.



[2]

(b) Work out the probability that Jack picks two red counters.

$$\frac{4}{7} \times \frac{4}{7} = \boxed{\frac{16}{49}}$$

$$\frac{16}{49}$$

(b) [2]

4. Mrs Mills buys 4 packs of treats for her cats, Fluff and Tigger.

She gives Fluff $\frac{1}{6}$ of a pack each day.

She gives Tigger $\frac{1}{5}$ of a pack each day.

For how many complete days will the 4 packs of treats last?

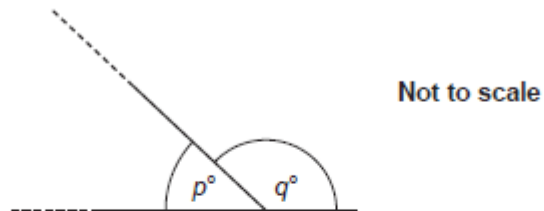
$$\text{per day : } \frac{1}{6} + \frac{1}{5} = \frac{5+6}{30} = \frac{11}{30}$$

$$4 \text{ packs } \Rightarrow 4 \times 30 \Rightarrow \frac{120}{30}$$

$$120 \div 11 = \underline{\underline{10.90 \text{ days}}}$$

..... 10 days [5]

5. An interior angle of an isosceles triangle is p° and an exterior angle is q° .



It is given that $q = 5p$.

- (a) Write the ratio $p : q$ in its simplest form.

$$p : 5p = 1 : 5$$

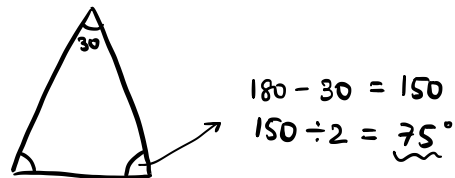
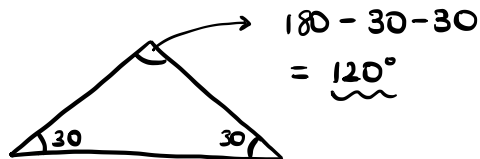
(a) 1 : 5 [2]

- (b) Work out the two different possible sets of angles for the isosceles triangle.

$$p + 5p = 180$$

$$6p = 180$$

$$p = \underline{30^\circ}$$



(b) Triangle 1: 30 °, 30 °, 120 °

Triangle 2: 30 °, 75 °, 75 °

[4]

6. (a) Write $\frac{1}{6}$ as a recurring decimal.

$$\frac{1}{6} \times 15 = \frac{15}{90} = \frac{16-1}{90} \quad \text{or}$$

$$\Rightarrow 1.\dot{6} \Rightarrow \boxed{0.\dot{1}6}$$

$$6 \overline{) 10} \Rightarrow \boxed{0.\dot{1}6}$$

$$\begin{array}{r} 0.166\dots \\ 6 \overline{) 10} \\ \underline{6} \\ 40 \\ \underline{36} \\ 40 \end{array}$$

(a) $0.\dot{1}6$ [2]

(b) Elsa divides a two-digit number by another two-digit number. She gets the answer 0.15.

She says that there is only one possible pair of numbers that will give this answer. Is she correct? Show how you decide.

$$\begin{array}{r} 100x = 15.555\dots \\ - 10x = 1.555\dots \\ \hline 90x = 14 \\ \hline \boxed{x = \frac{14}{90}} \end{array}$$

$$\left[\begin{array}{l} \frac{14}{90} \div 2 \Rightarrow \frac{7}{45} \leftarrow \text{not two-digit} \\ \frac{14}{90} \times 2 \Rightarrow \frac{28}{810} \leftarrow \text{not two-digit} \end{array} \right.$$

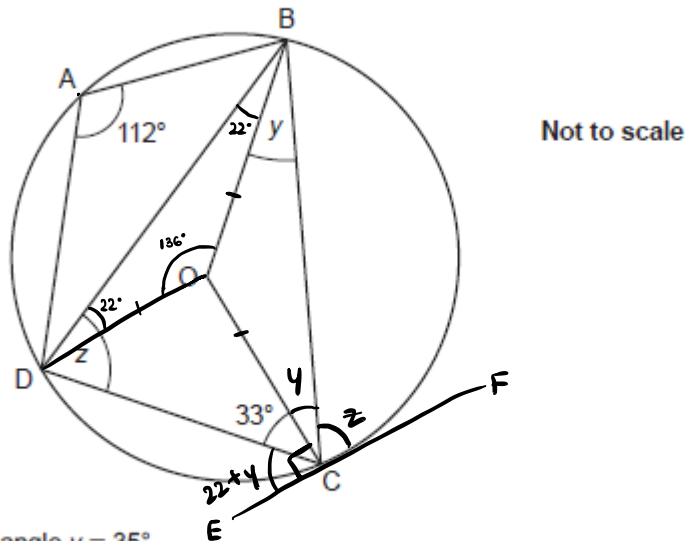
\therefore so $\frac{14}{90}$ is the only possible pair of numbers

Yes, she is correct

[4]

7. A, B, C and D are points on the circumference of a circle, centre O.

Angle BAD = 112° and angle DCO = 33° .



(a) Show that angle $y = 35^\circ$.

Give reasons for each stage of your working.

[4]

$$112 \times 2 = 224 \quad 360 - 224 = 136 = \angle DOB$$

$$\overline{DO} = \overline{BO} \text{ thus } \angle BDO = \angle OBD = \frac{180 - 136}{2} = 22$$

The tangent (\overline{EF}) is perpendicular to \overline{OC} radius

$$\angle DBC = \angle DCE = 22 + y$$

$$22 + y + 33 = 90$$

$$y + 55 = 90$$

$$\boxed{y = 35^\circ}$$

(b) Work out angle z .

Give reasons for your answer.

$$\angle BDC = \angle BCF = z \quad y = 35$$

$$\angle OCF = 90 = y + z = 35 + z$$

$$\boxed{z = 55^\circ}$$

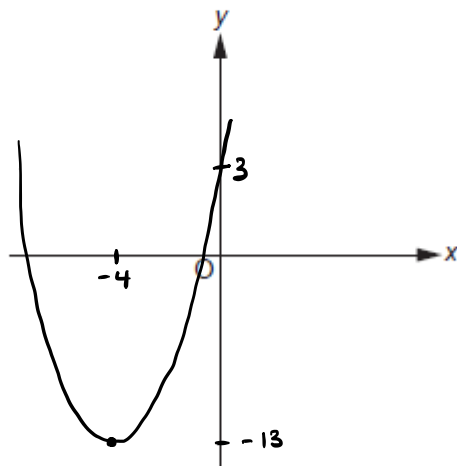
Angle $z = 55^\circ$ because according to alternate segment theorem $\angle BDC = \angle BCF = z^\circ$ and the angle between the tangent (\overline{EF}) and the radius (\overline{OC}) is 90° which is equal to $y + z$ [3]

8. (a) Write $x^2 + 8x + 3$ in the form $(x+a)^2 - b$. $(x+a)^2 = x^2 + 2ax + a^2$

$$\begin{aligned} x^2 + 2 \times 4x + 3 & \quad a=4 \\ = x^2 + 2 \times 4x + 4^2 - 4^2 + 3 \\ = (x+4)^2 - 16 + 3 \\ = \boxed{(x+4)^2 - 13} \end{aligned}$$

(a) $(x+4)^2 - 13$ [3]

(b) Sketch the graph of $y = x^2 + 8x + 3$.
Show clearly the coordinates of any turning points and the y-intercept.



[4]

y-intercept: $y = 0^2 + 8 \times 0 + 3$ $x = 0$

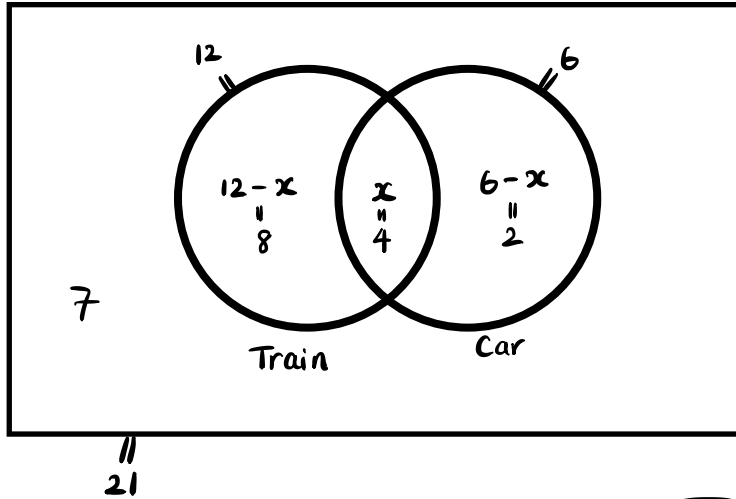
$$\boxed{y = 3}$$

9. 21 people travelled to a meeting.

- 12 used a train.
- 6 used a car.
- 7 did not use a train or a car.
- Some used a train and a car.

Two people are chosen at random from those who used a train.

Find the probability that both these people also used a car.



$$(12 - x) + x + (6 - x) + 7 = 21$$

$$25 - x = 21$$

$$25 - 21 = x$$

$$x = 4$$

$$\frac{4}{\cancel{3}12} \times \frac{3}{11} = \boxed{\frac{1}{11}}$$

$$\frac{1}{11}$$

..... [6]

Total Marks for Question Set 1: 51

OCR

Oxford Cambridge and RSA

Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact The OCR Copyright Team, The Triangle Building, Shaftesbury Road, Cambridge CB2 8EA.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge