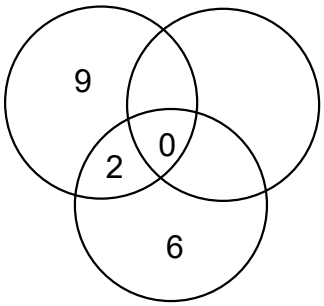
MATHEMATICS 2nd SAMs 2017 Unit 2 (Calculator allowed) Higher Tier	Mark	MARK SCHEME Comments (Page 1)
1. Correct construction of 60°. Correct construction of 90°. Correct bisector of 90°.	B2 B2 B1 5	With sight of accurate 'method arcs'. B1 for sight of 'method arcs' but not drawn accurately. With sight of accurate 'method arcs'. B1 for sight of 'method arcs' but not drawn accurately. With sight of accurate 'method arcs'. FT 'their 90°' Penalise −1 if angles drawn at incorrect positions or if triangle not completed.
2. TRUE TRUE FALSE FALSE	B2 2	B1 for 3 correct.
3. One correct evaluation $2 \le x \le 3$ 2 correct evaluations $2{\cdot}65 \le x \le 2{\cdot}85$, one < 0 and one > 0. 2 correct evaluations $2{\cdot}65 \le x \le 2{\cdot}75$, one < 0 and one > 0. ($x$ =) 2·7	 B1 B1 M1 A1 4	*Correct evaluation regarded as enough to identify if negative or positive. If evaluations not seen accept 'too high' or 'too low'.* x — $x^3 - 6x - 4$ 2 — –8 2·1 — –7·339 2·2 — –6·552 2·3 — –5·633 2·4 — –4·576 2·5 — –3·375 2·6 — –2·024 2·55 — –2·718... 2·7 — –0·517 2·65 — –1·290... 2·8 — 1·152 2·75 — 0·296... 2·9 — 2·989 3 — 5
4.(a)  2 in correct position. 6 in correct position. 9 in correct position. (b) 6 (c) $\frac{17}{45}$	 B1 B1 B1 B1 B2 6	FT 8 – 'their 2'. FT 17 – 'their 2' – 'their 6'. FT 'their total' for planning. B1 for a correct numerator only in a fraction <1. B1 for a denominator of 45 in a fraction <1.

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5. Correct statement of Pythagoras' Theorem $PR^2 = 18{\cdot}4^2 - 12{\cdot}5^2$ $= 182{\cdot}31$ $(PR=)$ 13·5(cm)	M1 A1 A1 3	 Also M1 for $18{\cdot}4^2 = PR^2 + 12{\cdot}5^2$. Or for sight of $\sqrt{182{\cdot}31}$
6. Sight of $2a + 3c = (£)71.5(0)$ AND $3a + 4c = (£)101$ or equivalent Correct method to eliminate one variable. First variable found $a = (£)17$ or $c = (£)12.5(0)$ Substitute to find 2nd variable Second variable found $c = (£)12.5(0)$ or $a = (£)17$ (4 adults and 2 children pay) £93	B1 M1 A1 M1 A1 A1 6	Accept their choice of variables for a and c. FT 'their equations' if of equivalent difficulty. Allow 1 error in one term, not one with equal coefficients. FT 'their 1st variable'. FT their values if both M marks gained. '£' required.
7.(a) $(x - 7)(x + 3)$ $x = 7$ AND $x = -3$ (b) $\frac{2x - 14 + 2x + 5}{(8)} = \frac{4}{(8)}$ or equivalent. $4x - 9 = 4$ or equivalent. $x = 3\frac{1}{4}$ or equivalent.	B2 B1 B2 B1 B1 7	B1 for $(x \ldots 7)(x \ldots 3)$. Strict FT from their brackets. B1 for 1 error. FT until 2nd error. Mark final answer.
8. $D\hat{A}C = 36(°)$ Angles in the same segment are equal. $DC = 5{\cdot}1 \times \tan 36$ Angle subtended at the circumference by a semicircle is 90(°) . $DC = 3{\cdot}7(\ldots)$(cm)	B1 E1 M1 E1 A1 5	May be seen on diagram. Accept unambiguous statement of this fact. Accept $DC / 5{\cdot}1 = \tan 36$. Accept unambiguous statement of this fact.
9. (Least possible distance =) 399·75 (m) (Greatest possible distance =) 400·25 (m) (Least possible time =) 73·5 (seconds) (Greatest possible time =) 74·5 (seconds) (Least possible av. Speed =) $\frac{399{\cdot}75}{74{\cdot}5}$ OR (Greatest possible av. Speed =) $\frac{400{\cdot}25}{73{\cdot}5}$ = 5·36(5….) AND 5·44(55…) (m/s) Organisation and communication Accuracy of writing	B2 M1 A2 OC1 W1 7	All four correct values. B1 for any 2 correct values. One correct use of formula. FT their values. 2 **distinct** values.

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10. (a) x = 0·49191… and $100x$ = 49·19191… with an attempt to subtract, OR equivalent (e.g. $1000x - 10x$) $\frac{487}{990}$ (b) False, AND a correct reason e.g. 'a needs to be a cube number for it to yield an integer' or a counter-example e.g. $6^{\frac{2}{3}} = \sqrt[3]{36}$ and 36 is not a cube number. (c) (i) $10\sqrt{2}$ (ii) $4\sqrt{5}$	M1 A1 B1 B1 B1 5	OR 48·7 / 99 Mark final answer.
11. $\frac{40}{260}$ × the number of employees in any category. Male / Female Full-time: 19 / 5 Part-time: 3 / 13	M1 A2 3	A1 for any 2 or 3 correct answers.
12. (a) Tangent drawn Idea of increase in y / increase in x Gradient from a reasonable tangent m/s^2 OR ms^{-2} (b) Split into 6 areas and attempt to sum (Area =) ½×10(0+2×10+2×30+2×32+2×33+2×39+40) = 1640(m)	S1 M1 A1 U1 M1 M1 A1 7	Or equivalent. Award for up to 1 error in reading scale. CAO.
13. (l^2 =) $10^2 + 5^2$ l^2 = 125 OR (l =) √125 (l =) 11·1(803…) or 11·2 (Surface area =) $\pi\times5\times11\cdot1(803\ldots) + 2\pi\times5\times8 + \pi\times5^2$ = 505 to 506 (cm^2)	M1 A1 A1 M2 A1 6	FT *'their l'*. M1 for any 2 of the 3 terms.
14. (a) $3(x + 1) - 5(2x - 1)$ as numerator AND $(2x - 1)(x + 4)$ as denominator. OR multiply throughout by $(2x - 1)$ and $(x + 4)$ $3(x + 4) - 5(2x - 1) = 6(2x - 1)(x + 4)$ $0 = 12x^2 + 49x - 41$ (b) $x = \frac{-49 \pm \sqrt{49^2 - 4\times12\times(-41)}}{2\times12}$ $x = \frac{-49 \pm \sqrt{4369}}{24}$ x = 0·71 and x = −4·80	M2 A1 A1 M1 A1 A1 7	Brackets required or implied later. M1 for either correct numerator or denominator, or multiply throughout with 1 error. Convincing i.e. need to see at least $12x^2 + 42x - 24$ Allow one error, in sign or substitution, but not in the formula. CAO. CAO.

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15. Use of $\frac{1}{2}$absin$C$ followed by cosine rule $24{\cdot}25 = \frac{1}{2} \times 12{\cdot}7 \times AD \times \sin 132°$ $AD = (2 \times 24{\cdot}25)/(12{\cdot}7 \times \sin 132°)$ $AD = 5{\cdot}13(883\ldots)$ or $5{\cdot}14$ (cm) $DB^2 = 12{\cdot}7^2 + AD^2 - 2 \times 12{\cdot}7 \times AD \times \cos 132(°)$ $DB^2 = 275(\cdot 036\ldots)$ $DB = 16{\cdot}5(842\ldots)$ or $16{\cdot}6$ (cm)	S1 M1 m1 A1 M1 A1 A1 7	FT provided M1 awarded. *Alternative solution (using a new point E which is vertically above D):* *DE = area / 12·7 = 3·819(cm)* *S1* *AE = DE / tan48(º) = 3·439(cm)* *M1* *BE = AE + AB =16·139(cm)* *m1* *Using Pythagoras, $DE^2 + BE^2$ =* *M1* *275·05* *A1* *BD = 16·5(8…) or 16·6 (cm)* *A1*